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ABSTRACT

Tacit knowledge is a generally unarticulated, preconscious form of knowledge that forms a basis for human judgment and decision making. Tacit knowledge is acquired primarily through experience, usually observation of and working with "qualified" teachers or mentors. Tacit knowledge may also be described as "practical," that is, derived from experience or practice, and "taken-for-granted." It involves either skill (the ability to do something well) or perceptual ability (gaining knowledge through the senses that would not be obvious to an inexperienced person). It generally requires a background of knowledge or a theoretical (conceptual) framework as a context for understanding. Decisions based on tacit knowledge can be articulated by bringing the tacit knowledge to the level of consciousness; the reasoning involved will be understood by persons of similar background. Such understanding by other professionals separates tacit knowledge from the realm of intuition. Two traditional models of judgment and decision making--the Wilderness Education model and the Priest model--assume that experienced leaders recognize a problem and then think through sequential steps to arrive at an appropriate decision. These models do not recognize that many "decisions" of experienced leaders are not consciously made, but result from "preconscious" processes or habits. An experienced leader's tacit knowledge also figures in anticipation and prevention of problems, instant recognition that a problem exists, and a constant unconscious form of evaluation and decision making. Provides examples from outdoor recreation and adventure situations. (SV)

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THE ROLE OF TACIT KNOWLEDGE IN JUDGEMENT AND DECISION MAKING

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ABSTRACT:

The literature on judgement and decision making for outdoor leaders presents a rule-based logical model of decision making and judgement emulating the logical model of a computer. Such a model presupposes that computers "think" in the way we do (or ought to do).

This presentation disagrees with the computer-based model of human thinking. It discusses a concept called "tacit knowledge" and its vital role in judgement and decision making. The concept of tacit knowledge better explains the decision making process of human beings. Those who understand tacit knowledge will have a far better understanding of judgement and decision making, and the teaching of leadership and judgement.

AUTHOR'S NOTE:

The actual presentation involved a 20 minute introduction to two models of judgement and decision-making (J/DM) and to the concept of tacit knowledge, then followed with 40 minutes of discussion, questions, and answers as the audience grappled with the concept and its application. The following "outline" highlights most of the key points that were brought out during the discussion. A few points and examples are added. Several are omitted.

WHAT IS TACIT KNOWLEDGE?

- "Tacit knowledge" is a term developed by a Michael Polanyi, who was both a scientist and a philosopher of science. His major work on the topic was published in 1958.

  A major thrust of his work was to demonstrate/ explain that the "objective" knowledge of science was based upon a bedrock of "tacit knowledge."

- Tacit knowledge is a form of knowledge.

  -- That is, it has the status of certainty that other forms of knowledge have.

  -- It is to be distinguished from intuition, gut feelings, or mere personal opinion.

  -- It is <u>not</u> "subjective." It is not based upon a person's "whim."

- As <u>tacit</u>, it is generally unarticulated, and if you attempt to articulate it, it is difficult to express or explain.

  -- Consequently, it may be difficult to recognize as a legitimate form of knowledge (that it is not something "subjective").

- Because it is difficult to articulate, it is easier to explain through example.

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-- An example Polanyi used is that of the medical doctor reading an x-ray. In certain x-rays, the doctor will quite easily see the broken neck, whereas the untrained lay person will be unable to see it.

-- In fact, even if the doctor takes the time to attempt to show the lay person the signs indicating the break, the lay person may still be unable to see clearly that there is a break.

-- Other examples include the professional winetaster with the highly developed sense of taste (and smell) or the professional chemist with a sensitive nose.

-- In all these cases, the trained professional can readily distinguish differences and make judgements about what they perceive ("the neck is broken," " this wine is an excellent [or sour] example of x," " this chemical is clearly y."),

-- In contrast, the untrained lay person will be unable to "understand" the "reasons" behind those judgements.

-- However, with appropriate training and through a appropriate guidance, the lay person can learn to perceive what the professional perceives and make appropriate judgements.

- Examples in the outdoor recreation field include the ability to:

a) "read" a whitewater river;
b) see or diagnose a difficulty in learning to ski (or paddle, or climb, etc.);
c) recognize the conditions for, and the earliest subtle signs of, hypothermia;
d) recognize this is a situation in which hypothermia could readily occur;
e) follow an overgrown, unused trail;
e) judge whether a given student has sufficient maturity or ability to lead a group, or to go off on their own.

- Tacit knowledge is acquired primarily through experience, generally acquired through working with other experienced, "qualified" or professional persons.

-- That is, it is learned primarily through the examination or observation of many examples (accompanied by periodic reflection), under the tutelage of teachers, mentors, or other professionals.

-- Polanyi also called it "practical knowledge." By use of the word "practical," he did not mean "useful;" he meant knowledge derived from practice. In Polanyi's context, practical knowledge is knowledge derived through experience and practice.

- It often functions pre-consciously.

-- As pre-conscious, it functions at a level of consciousness prior to one's becoming conscious of it. As pre-conscious, it can fairly easily be brought to the level of consciousness, but it frequently is not necessary nor done so.

-- That which is known through tacit knowledge might be described as "taken-for-granted." Again, as taken-for-granted, it is accepted as known without much thought given to how or why one knows it.

- Let's look at some more examples:

-- You are cross-country skiing on a snow-covered trail with a bunch of beginning leaders. As you follow the trail, you look for the subtle signs indicating the trail. You look for old blazes, for unnaturally

straight breaks in the trees, for logs or branches which have been sawed off, for a depression in the snow.

You find that you are following the trail, with difficulty perhaps, but nevertheless you know you are on the trail. Yet your students are confused. They do not see the signs which you see, and they are skeptical you know what your doing. As you were following the trail, you may or may not have been consciously looking for the various signs. However, if you were not, once your students start questioning you, you will likely become more conscious of what you're looking for. You could then point out the signs to students. Some of your students will say "Oh, I can see some"; some will be unable to see, despite their best efforts, and will remain skeptical.

The knowledge you have of following the trail is tacit knowledge. It has been acquired through experience, possibly with a mentor showing you the signs. This knowledge is not acquired easily, not through books alone, and can only be acquired through considerable practice.

- Here's a second example.

At one time I was a Certification Examiner in Nordic (cross-country) Skiing for the North-West Region of the Professional Ski Instructors of America. At that time there were four levels: Candidates, Associate Certified, Full Certified, and Examiners. At a certification exam, there would be 3 examiners plus back-up apprentice examiners. As an examiner, and as a person who had gone through the full process from Candidate Instructor to Examiner, I was able to make number of observations which focussed around what I later realized was tacit knowledge. They are these:

a) It was remarkable how consistent the three examiners were in being able to judge whether an examinee was skiing at a No-pass level, at the Associate level, or at the Full-Cert level. A few of the examinees were skiing at a borderline level between No-pass and Associate, others were clearly skiing at one of the three ability levels. For the most part, we were in agreement in our judgements.

b) Those who did not pass to the Associate level frequently could not understand why they did not pass.

c) Associate level candidates could not distinguish between Associate level and Full-Cert levels of skiing.

d) As examiners we had strengths and weaknesses. Some of us were better at track skiing, others were better at telemark or parallel skiing. Regardless, Associate level or even Full-Cert level candidates could not distinguish skill differences among us.

e) As a Nordic Examiner, I was given the opportunity to attend Alpine (downhill) certification exams as a guest back-up examiner. What was really intriguing was that in Alpine skiing, I was unable to distinguish the difference between No-Pass candidates and Associate level alpine candidates, even though I had no difficulty distinguishing No-Pass and Associate level nordic candidates.

f) Thus, in nordic skiing I (and other examiners) had the ability to distinguish levels of skiing, but only the highest candidates shared this ability. However, in alpine skiing I did not have this ability. In nordic skiing I had acquired the tacit knowledge, but in alpine I had not.

- Examples of tacit knowledge may be either: a) perceptual, or b) a skill or practice (or a combination of perception and skill).

It involves either:

a) the ability to do-- knowing how to do something well, or "how to" knowledge

b) the ability to perceive-- the knowledge is obvious to any trained person. They can know by the immediate sight or by the sound, smell, or touch that something is the case; and this would not be obvious to the untrained person.

- It also generally requires a background of knowledge or a theoretical (conceptual) framework as a context for understanding.

As a form of knowledge, reasons for decisions or judgements based upon tacit knowledge can be articulated.

-- That is, if one brings it to the level of consciousness and thinks about it, one can articulate reasons to explain a decision based on tacit knowledge.

-- Other persons with a similar background of experience and knowledge will understand the reasoning.

However, <u>such reasons may not make sense to the person who does not have a sufficient background</u> of knowledge and experience.

- Generally, when discussing a situation related to tacit knowledge, fellow professionals do not need to articulate that which is tacitly known. Tacit knowledge is a given, a building block upon which to make other, more conscious or deliberate, decisions.

- That other professionals, given a similar background of experiences and theoretical framework, can understand and accept decisions based upon tacit knowledge is a characteristic separating tacit knowledge from the realm of "subjectivity" or "intuition."

Because tacit knowledge often functions preconsciously, it may be confused with intuition. But unlike decisions based upon intuitions, if pressed and appropriately trained, the person making decisions based on tacit knowledge can clarify the grounds upon which the decision is made. An appropriately trained person can make conscious, can point out, those features which were being observed or were functioning pre-consciously.

Tacit knowledge is "objective" because other similarly trained professionals can arrive at similar observations and make similar decisions based upon their observations. Being unable to make similar observations, an untrained person may think the professional is acting upon "intuition" or is being "subjective."

- That there is tacit knowledge may also be a form of tacit knowledge.

-- That is, it is typically not recognized as a form of knowledge, and only those with sufficient experience and the background of a conceptual (theoretical) framework will understand the concept.

-- Furthermore, the concept of tacit knowledge is best explained, understood, through the use of appropriate examples explicated with appropriate tutelage.

TWO TRADITIONAL MODELS OF JUDGEMENT AND DECISION-MAKING

- In the literature on judgement and decision-making (J/DM), there are two models of J/D-M which are fairly well known. One is the Wilderness Education

(WEA) Model (Cain, 1991); the other is the Priest model (Priest, 1988; Priest & Dixon, 1990).

- The WEA model. In the WEA model, the leader recognizes a need to make a decision, collects all available relevant information, identifies and analyzes potential options for actions, and identifies consequences of those actions. Then the leader (or the group) selects an option. The option is executed and the results are evaluated.

  There are some significant shortcomings in this model. It does not explain how a leader observes and knows there is a need to act and makes a decision to act. It does not explain how a leader knows what are appropriate potential options to consider nor knows the appropriate potential consequences. It does not explain how a leader knows the most appropriate options, nor does it explain how a leader knows which is the best decision.

  In sum, in the world of all possibilities and perceptions, the model requires selection of the appropriate possibilities and perceptions and requires rejection without consideration of a large (perhaps infinite) number of possibilities. This model does not explain how a leader pre-consciously does these things.

- The Priest model. In the Priest model, human J/DM is compared to a computer. Both humans and computers are said to process information in the same way. In this model, "judgement is a series of procedures undertaken by the human brain in an effort to fill in for information that is uncertain, but nonetheless important to the problem-solving process" (Priest & Dixon, p. 28).

  The way judgement and decision-making works is that, when faced with a question, the human computer retrieves appropriate general concepts derived from experience and inductive reflection, uses judgement to fill in gaps as necessary, applies logical deductive rules to these concepts, and generates a judgement. This judgement is modified as necessary using the same procedure.

  The standard computer today is the digital computer. Computer programmers program their computers using what is called "two-valued" logic. Two-valued logic involves a series of step by step questions, to which each answer is either yes or no. It follows basic rules of deductive logic. Under this computer-based model of human judgement and decision-making, judgement provides the necessary information for the deductive logic of the human computer to work, and a judgement is the output or the conclusion. However, ultimately, a computer model of judgement requires that the complex realities of the world be reduced to a series of simplified yes-no answers. [See footnote 1.]

  As with the WEA model, the Priest model requires that a person make decisions about and has to know (decide, judge) what are the appropriate general concepts, and a person has to know (decide, judge) which information in the current situation is appropriate. Thus under this model, before the proper judgements can be deduced, judgements have to be made. As with the WEA model, what is the basis for knowing these prior judgements?

  Ultimately, the problem is that arriving at logical conclusions is much simpler in a computer than in the real world, for in the real world the appropriate logical conclusion depends upon what data is chosen to put into the logical mix. The decisions regarding which data to use is based on something other than deductive logical rules.

- Despite these shortcomings, those models of decision-making can be useful in certain limited situations, namely those situations in which the leader has the luxury of the time to brainstorm options and make conscious, deliberate decisions. The WEA model can also be used as a structured method for teachining tacit knowledge and judgement.

- But the WEA model does not describe how we make judgements, and either of these models can be used only for a relatively small number of the decisions a leader must make.

  As we know, many accidents are the result of an accumulation of small mistakes or errors in judgement. Many of these mistakes are made unconsciously-- they are not intended. Further, incidents often may result from decisions not made.

  In part this happens because leaders are not only making decisions from the moment they wake up, but they are making decisions even before they go on the trip. Some accidents (such as those involving hypothermia) are set in motion with the decisions (or non-decisions) regarding what clothing or equipment to bring or the objective of the excursion.

- Good judgement, then, is based upon an innumerable number of conscious and pre-conscious decisions which are made on an on-going basis. It is not explained by the two popular decision-making models just described.

  An model of J/DM which uses the concept of tacit knowledge has much greater explanatory power.

JUDGEMENT AND DECISION MAKING

- Standard models of judgement and decision making (J/DM) start with experienced leaders recognizing or knowing there is a problem and then thinking through sequential steps to arrive at an appropriate decision.

- There are three significant situations for which the traditional models of judgement and decision-making (J/DM) do not account. They don't explain the following:

  1) Experienced leaders are far better able to read subtle signs than are inexperienced leaders; and further, are far better able to recognize and know there is a problem, or impending problem, than are inexperienced leaders. For examples:

     a) An experienced leader knows that a given situation is very conducive to hypothermia; the experienced leader knows through body language that a certain individual is cold, and knows through experience that too often the leader needs to actively intervene to get cold persons to put on clothing. A leader with "good judgement" will intervene early; the inexperienced leader will too often ignore the signs until they can no longer be ignored.

     b) You are cross-country skiing out in the woods in the afternoon. You come across a skier who has taken a fall and is writhing in pain. The two companions of the skier are not experienced in the outdoors, do not have sufficient clothing for being inactive, do they have any emergency equipment, and do not know what to do. You see that the lower leg is unnaturally bent just above the top of the boot. If you have seen enough similar situations, you immediately know that the leg is broken. (You also have been trained not to diagnose, but nevertheless there is no doubt in your mind.)

        You also immediately know there are a number of concerns which will need to be dealt with. In addition to the standard first aid textbook items, you know that hypothermia and shock are a serious concern; you know that at some point you will need to send for help, or get it yourself; you know that you will need to be concerned with yourself (do you have clothing and equipment to stop and assist?); and you know you have to deal with the uninjured persons and your own group, if you are with one. It is very cold out, days are short, and

there is not a lot of time before the sun disappears behind the trees.

In this second problem, there are a number of significant concerns that need to be addressed. These concerns, and others, will immediately spring into the mind of the experienced leader and be recognized as problems to be dealt with.

2) Experienced leaders often immediately know (without thinking) appropriate actions and solutions, whereas beginners would not.

3) Throughout the day, experienced leaders make numerous routine decisions (judgements) without consciously recognizing a problem and then thinking through to a solution. For example, experienced leaders routinely:

   a) decide to get up in the morning, put their clothes on, eat (or not eat) breakfast); decide what to eat, how much to eat, whether to air out their sleeping bag, etc; decide when they have had enough breakfast, decide when to start packing for the day, decide whether to visit the toilet, etc.

   b) bring certain items of clothing and certain equipment on trips (the Ten Essentials, other);

   c) check the sky for changes in the weather, and make judgements concerning the weather and whether it's stable or changing;

   d) check the map and the time to know where they are and the progress they are making; judge that they are making good time or slow time;

   e) monitor the group to see how they are doing physically and psychologically, whether they are eating and drinking, whether they are properly dressed, etc.; make observations and judgments about people and those issues;

   f) decide to take rest breaks and meal breaks; decide to make a decision regarding when to take those breaks, or decide to seek input from others, etc.

   g) plus hundreds of other routine decisions.

4) Prior to the excursion, the leader will have made innumerable decisions, some of which have important effects on decisions made during the trip and on the advent of an accident or incident. These decisions also are made without the brainstorming-and-thinking-to-a-logical-decision process of the standard models.

- The sorts of "decisions" and "judgements" indicated by 3 and 4 above are not really consciously determined decisions and judgements-- rather many are just standard operating procedure or habit.

  Most of the decisions indicated in 3 and 4 are not really decisions. That is, they are not fully consciously made; the leader does not think through the consequences before making the decision. At best they are quasi-decisions, or they could be called "pre-conscious" decisions. The judgements, also, are often pre-consciously or habitually made.

  Nevertheless, these quasi-decisions and judgements are necessary and unavoidable, and some have significant consequences.

- There seems to be a tendency to think that good judgement is exhibited (or has failed) only when their an immediate need for a good decision. Examples in the literature are usually instances where the leader is compelled to make a good (sound) decision or else something dire will happen.

For example, Miles (1987) defined judgement to be "the making of a decision when faced with a potentially hazardous or risky situation" (p. 503). He used the example of a mountaineering group on a glaciated mountain having to make a decision whether to continue in the face of the impending storm.

Or Priest (1988) used the examples of how to pass a car and how to evacuate an injury, both of which were potentially hazardous situations in his scenarios.

- In fact, when you think about the large number of decisions made, and not made, prior to a "hazardous situation," you realize that the traditional models are appropriate for only a relatively few J/DM situations.

- An appropriate model of sound judgement needs to take into account the myriad number of decisions and judgements, non-decisions, and quasi-decisions the experienced leader makes on an ongoing basis both during and prior to the excursion or the hazardous situation.

- There are two elements crucial for sound judgement. One is tacit knowledge.

- Another crucial element is habit, or routine practices.

  -- We do not make decisions for everything we do. We do not mentally run through a sequence of steps to make decisions to do things.

  -- Instead we rely upon habits for much of what we do. A leader with sound judgement has routines and habits or standard practices.

  -- A leader with sound judgement does not rethink these habits prior to employing them. Rather, the leader simply uses them.

  -- The use of habits frees up the leader's mind to pay attention to other matters which are not governed by habit.

  -- The use of habits frees the mind to attend to things which might be pre-conscious, things which might need to be elevated to the status of conscious.

- Anticipation of problems, of issues, is an important component of sound judgement. Knowing what is likely to occur, or apt to occur, in a given situation is crucial. Being able to recognize this is such a situation is crucial and is due to tacit knowledge.

  -- Such knowledge only comes through experience and practice (combined with theoretical knowledge).

- Making decisions is <u>not</u> a matter of going down a list of options, or a list of pro's and con's.

  -- Giving adequate weight (value) to the pro's and con's is crucial. Knowing (understanding) the appropriate weight is a matter of tacit knowledge.

  -- Identifying what should, or should not, be on the list of pro's and con's is also crucial. Again such identification is a matter of tacit knowledge.

  -- Being able readily to bring up from memory appropriate candidates for such a list is important.

     -- A computer would go through an entire list and compare each item to selected criteria; the computer may do this very quickly.

     -- But a human being's mind does not work that way; rather the experienced human mind goes rather quickly to the appropriate candidates. This is tacit knowledge at work.

- Before a decision can be made, the need to make a decision has to be recognized; the appropriate question has to arise, to occur to the person.

  -- The act of bringing the appropriate question to the conscious surface is not a conscious act. Rather the arising of the question is accomplished tacitly, pre-consciously.

  -- The appropriate question is far more likely to arise in the person with experience and training. The appropriate question is simply unlikely to occur to the inexperienced beginner.

  -- Deciding to recognize an appropriate question is not a conscious decision; it is the result of tacit knowledge or understanding.

- The human being's brain is constantly filtering out information (perceptual experience) and, concurrently, allowing other information to be admitted.

  -- The experienced person's mind routinely filters out extraneous information, and holds in abeyance, or focuses in on other information perceived preconsciously to be relevant. It simply is humanly impossible to consider consciously all possible information.

  -- Decisions depend on information. But you do not make conscious decisions regarding what information to filter out or let in.

  -- Information is sorted out, organized pre-consciously, before you consciously think about it.

  -- The ability to recognize which information is relevant is a product of tacit knowledge.

- Often, the decision-making process can <u>not</u> be a series of steps.

  -- There simply may not be time.

     -- (A person is pinned in a boat. A person has stopped breathing. A person is developing signs of hypothermia.)

  -- The experienced leader simply "knows" this is a given problematic situation.

     -- (A person is pinned in a boat. The leader does not ask if a problem exists. The leader knows. A beginner might wonder or ask.)

- The experienced leader has developed habits which are appropriate and prevent a problem from occurring. These habits are a result of appropriate decisions (perhaps pre-conscious) made much earlier, forestalling the problem.

  -- The leader is usually making on-going decisions-- constantly evaluating. These are generally not conscious, but rather pre-conscious.

     -- You don't make a decision to evaluate a situation, you simply do so.

     -- The decision to stop and make a conscious, deliberate decision is crucial. But the first decision (to stop and make a conscious, deliberate decision) is not the result of a series of deductive steps.

     -- A person with sound judgement often does not answer the question "does a problem exist?" with a "yes" or a "no." More often the appropriate answer is "maybe" or "there might be in the future and I had better monitor it."

  -- Therefore, unlike the digital computer's use of simplistic either/or two-valued logic, persons with sound judgement function in the realm of "multi-valued" logic.

IN SUM

- Sound judgement relies upon:

  -- tacit knowledge for a pre-conscious selection of appropriate information,
  -- the use of appropriate habits and pre-conscious decisions and judgements,
  -- the use of unarticulated tacit knowledge to make judgements and to provide a basis for conscious decisions.

- Many, perhaps most, "decisions" and judgements are made pre-consciously, because the leader with sound judgement is actively aware and is engaged in ongoing evaluation of people and the changing environment.

  -- This ongoing active awareness and ongoing evaluation is not an ongoing series of decisions, but it is crucial to sound judgement.

- Many, perhaps most, decisions are routine, a matter of habit or standard practice, rather than a result of conscious decision-making.

- Consciously made decisions are not the result of a series of logical steps.

- Rather, conscious decisions are the result of awareness and thought along with sound habits, tacit (practical) knowledge, theoretical knowledge, and appropriately (but tacitly) selected information about the given situation and the environment the leader is in.

- Judgement is not mere opinion, nor is it subjective.

- Matters of judgement can be backed by good, sound reasons, although it may be difficult for the person to articulate those reasons.

  -- Opinions can not be backed by sound reasons.

- Sound judgement requires a background of experience and knowledge. This background gives a basis for the soundness of the reasoning.

  -- Knowledge includes both tacit knowledge (knowledge derived through practice and experience) and theoretical knowledge (knowledge derived though books, classes, and understanding the theory).

How, then, do we describe the leader with "good judgement"? John Miles defined good judgement as "making a decision [with a satisfying outcome] when faced with a potentially hazardous or risky situation" (p. 503).

But actually, within the context of tacit knowledge and habit, the leader with good judgement is better described like this:

> A person who, as a consequence of experience, knowledge, and practice, has developed sound habits leading to proper preparation and prevention of problems, has developed the ability to recognize and forestall potentially dangerous situations, and has acquired the ability to make decisions and react quickly and appropriately enough in situations imposing immediate danger.

However, key elements of good judgement are prevention and preparation. The exercise of good judgement and decision-making starts from the very beginning of the excursion, back at its very inception. The leader who has the experience, knowledge, and ability to forestall a problem before it is a problem ultimately has better judgement than the leader who merely reacts to dangerous situations as they occur.

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FOOTNOTE

[1] Currently, the digital computer does not mimic the human brain. The human brain and the digital computer work in very different ways. Artificial intelligence researchers recognize that computers have very great computational powers, and can do things such as play chess through a very fast working out of possible combinations, but the human brain does not work well in that way.

The human brain uses what is better described as a heuristical approach based on best-case approximations, in which an answers in the logical steps do not have to be clearly "Yes" or "No." The brain uses what is better called a "multi-valued" logic. (For a more complete discussion, see Nadeau, 1991.)

In areas in which possibilities are clearly defined, such as playing chess, computers are very powerful. However, researchers have found that in matters of things such as perception, the computer has much less capability than a human baby. A baby can easily know its mother's face, whereas a digital computer can not recognize that face.